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IBM

Installation Manual—Physical Planning

RAMAC 305

IBM

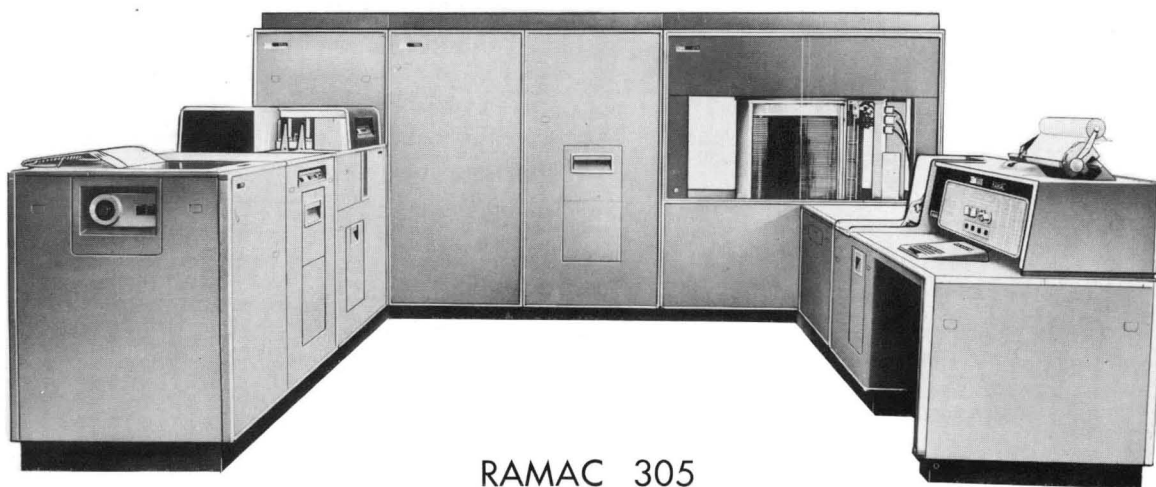
Installation Manual—Physical Planning

RAMAC[®] 305

This manual replaces, but does not obsolete, Form X21-7960-1.
Only the cover format and illustration sequence have been changed.

This manual contains information needed for planning the installation of an IBM RAMAC 305 Data Processing System.

In addition to technical information required for physical planning, it contains recommendation and suggestions that will help to make a convenient and effective installation.



RAMAC 305

IBM RAMAC 305 Physical Planning

Introduction

Successful installation of an IBM RAMAC 305 System requires intelligent planning. Physical planning should begin six to eight months in advance of the scheduled delivery of the machines. This manual should be studied carefully and consideration given to the following items:

1. Adequate and suitable floor space
2. Floor loading
3. Power source
4. Fire protection
5. Air conditioning
6. Stray magnetic fields
7. Recording instruments
8. Customer Engineering service area

General Description

The IBM RAMAC 305 basic system consists of the following units.

The 305 Processing Unit. This contains the magnetic process drum, magnetic core register, and electronic logical and arithmetic circuits.

The 350 Disk Storage Unit. This is made up of the magnetic disk storage unit with its access mechanism and the electronic and pneumatic controls for the access mechanism. Compressed air is supplied by a compressor located in the Utility Table.

The 370 Printer. This is an 80-position serial-output printer with tape control carriage.

The 323 Card Punch. It is similar to the 523 Gang Summary Punch and provides for 80 columns of output punching.

The 380 Console. This unit contains the card feed, which is similar to a 402 Accounting Machine feed, the typewriter, the keyboard, and indicator lights and control keys.

The 340 Power Supply. This unit supplies the power for all components except the motors in the 350 Disk Storage Unit.

The Utility Table. The Utility Table provides a work surface, and houses the air compressor, air receiver tank, and electrical circuitry for starting the files.

Physical Requirements

Assembly and Connection

The system is separated into individual units for shipment. After arrival at the installation, the units are moved on their own casters to the selected area.

The 340, 305, and 350 are then moved into position and aligned as one continuous section. The screw jacks, Figure 1, are used to adjust the units to conform to floor irregularities.

The 323 and 370 units are positioned as the left section and are placed next to the 340 unit. The 380 unit and the utility table form the right section and are placed adjacent to the 350 unit. The utility table remains caster-supported to permit movement for servicing. The 380 is supported by casters and two adjustable feet.

IBM supplies a standard set of signal and power cables used for connecting the machine sections. The cables run along the floor and enter the machines from the bottom. (See Figure 2.)

Average Weights

Unit	Total	L-End	R-End
305 Processing Unit	1,968	1,085	873
323 Card Punch	733	371	362
340 Power Supply	1,600	800	800
350 Disk Storage Unit	1,730	714	1,020
370 Printer	925	347	578
380 Console	1,035	607	428
Utility Table			
With 1 Compressor	441	289	152
With 2 Compressors	578	289	289
Total	8432 lbs. For System W/1 Compressor		
	8569 lbs. For System W/2 Compressors		

The above weights, and the machine dimensions which follow, should be used to determine passageway clearances, elevator and floor-loading requirements.

Unit Dimensions

1. Assembled, with covers*	Length	Depth	Height
Unit			
305 Processing Unit	65"	32"	72"
323 Card Punch	44"	32"	51"
340 Power Supply	32"	32"	72"
350 Disk Storage Units	65"	32"	72"
370 Printer	57"	32"	42"
380 Console	62"	32"	51"
Utility Table	39"	32"	29"

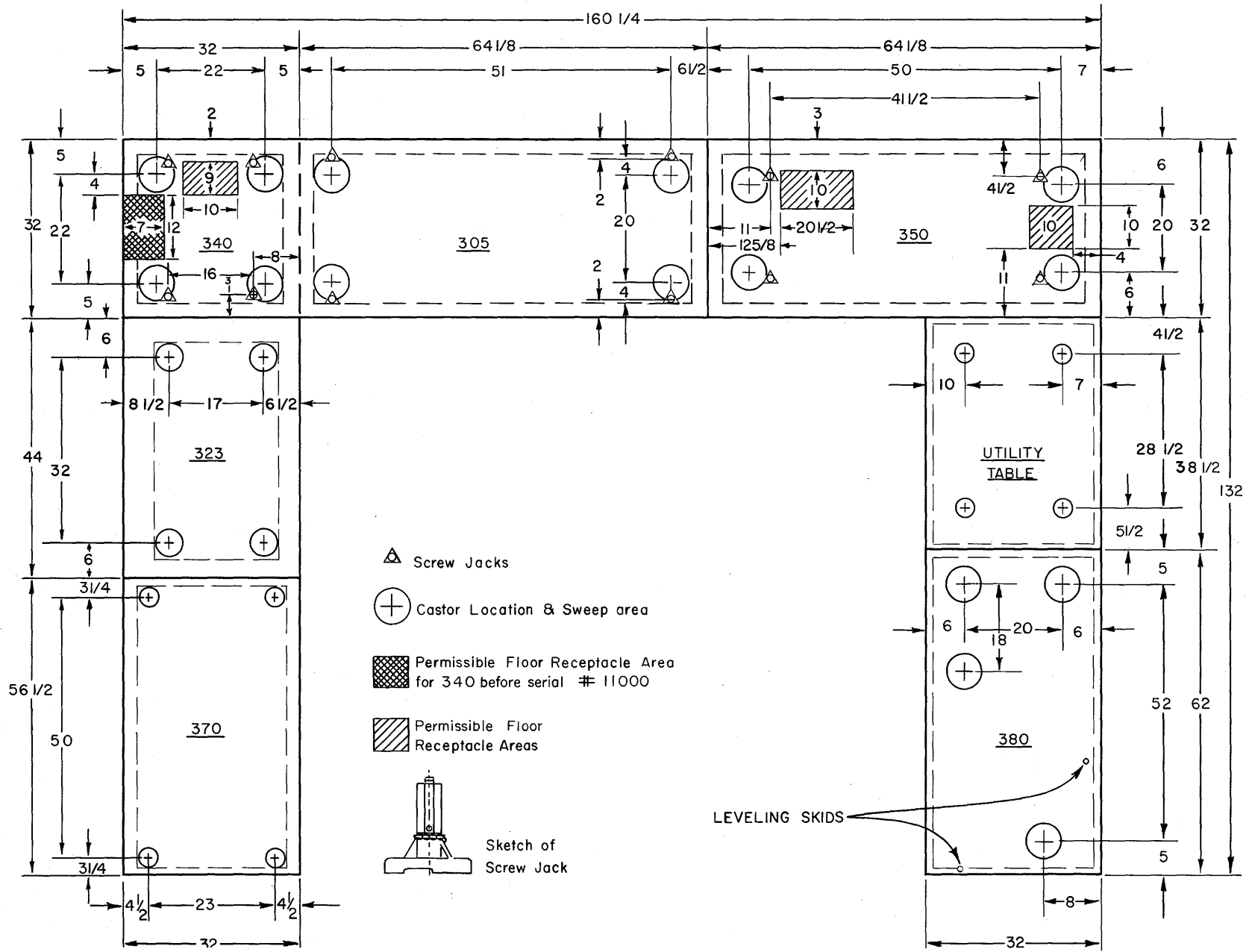


Figure I. Caster Locations

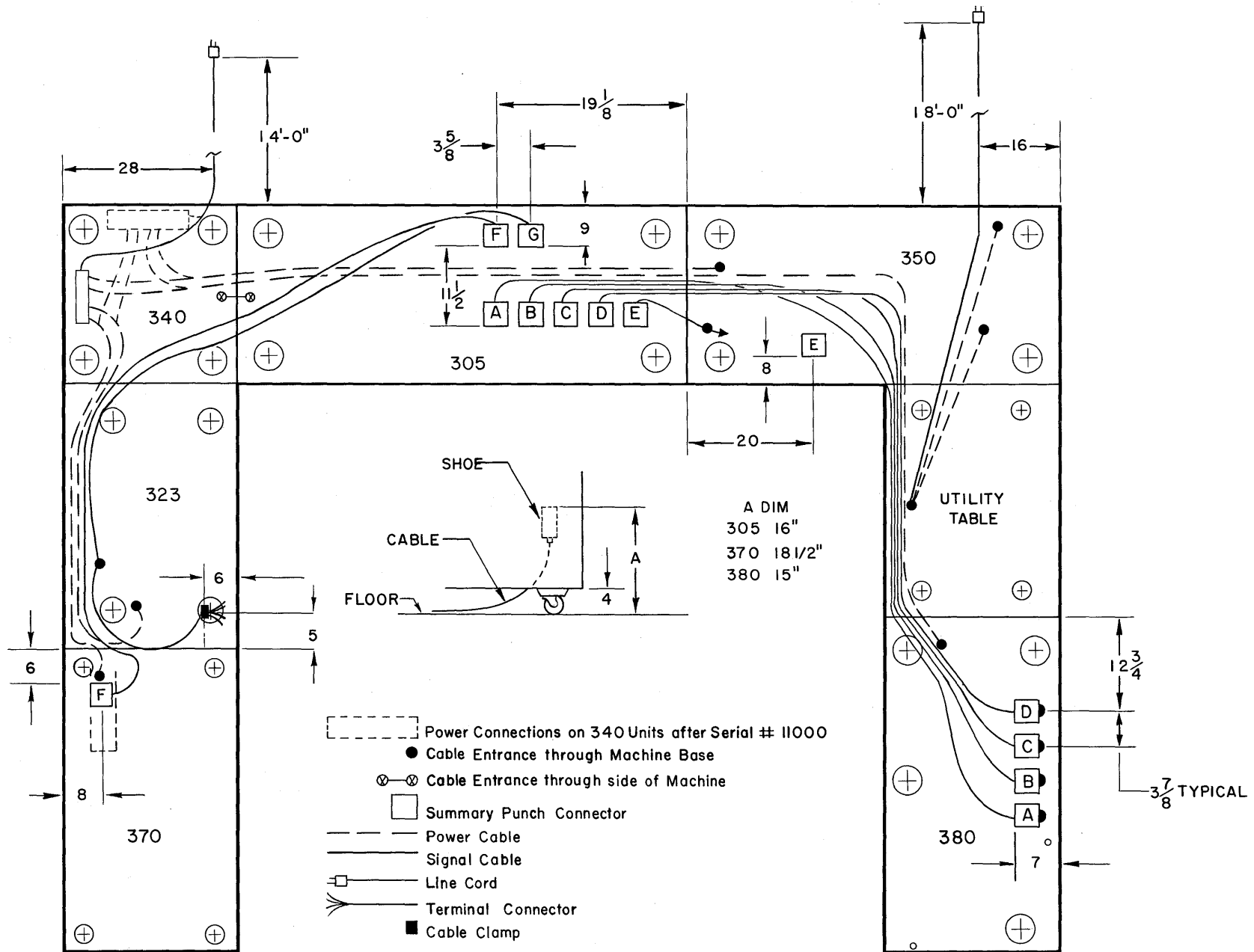


Figure 2. Cable Schematic

2. Without covers*

305 Processing Unit	60"	29"	68"
323 Card Punch	38"	23"	48"
340 Power Supply	29"	30"	68"
350 Disk Storage Units	60"	29"	68"
370 Printer	55"	30"	41"
380 Console	62"	29"	51"
Utility Table	39"	32"	29"

*Dimensions are rounded to the next nearest inch.

Layout and Space Requirements

The frontispiece shows the recommended arrangement of the 305 system. A standard set of cables and air hose is supplied for making this layout. Changes from this layout may require charges for extra cable.

The basic RAMAC system requires a minimum space of 18'1" by 20'4". Additional space should be considered by the customer for supplementary office equipment and a Customer Engineer's combination work bench and parts cabinet. The cabinet is provided by IBM. It should be located in an area 4' by 7' and convenient to the system. The cabinet dimensions are 39" high, 32" wide, and 22" deep. The doors swing out 16" on the 32" side.

The customer should give consideration to machine access requirements when he makes provisions for the RAMAC system. The gate and cover swing clearances plus the Customer Engineering service clearances are shown in Figure 3.

Two feet of headroom over the 350 Unit is needed for replacing a disk shaft. While the likelihood of this part failing is very slight, this clearance space should be considered in planning an installation.

Floor Loading

A floor capable of supporting 50 pounds per square foot is adequate for a RAMAC 305, if the layout adheres to the recommended clearances.

The customer's building engineer should be consulted to determine whether the floor loading capacity of the planned installation area is adequate. In some instances it may be necessary for the customer to install a sub-floor to accommodate the weight of the RAMAC units.

Connecting Cables (305 Basic System)

A set of cables and air hose of the proper length is supplied by IBM for connecting the machines together. Two types of cable are used, power and signal. Signal cables are equipped with summary-punch type connectors, and power cables have terminal type connectors.

All of these cables are flexible and rubber-covered. The largest is 1 1/8" in diameter and has a 5" minimum bending radius.

Fire Protection Equipment

Portable carbon dioxide fire extinguishers of suitable size and number should be provided in the machine room, subject to the local building code and fire insurance requirements. This is the recommended non-wetting, fire extinguishing agent for electrical equipment (Class C Hazard). In some cases local building codes, ordinances, and insurance regulations, require automatic water sprinklers. We then suggest one of the following measures if they are in agreement with the codes and regulations. (See Safety Section for additional material.)

1. Pre-action sprinkler system

High temperatures actuate heat sensitive devices which open a control valve. This valve, located outside the room, admits water into the sprinkler piping before the sprinkler heads operate. This type of system minimizes the possibility of accidental discharge of water due to failure or mechanical breakage of the automatic sprinkler heads.

2. Higher temperature sprinkler heads

Replace sprinkler heads with high rated ones, preferably with ratings in the intermediate range of 175 to 212°F.

Vibration

It may be necessary to install a machine in an area that is subject to minor vibrations. The machines can withstand a sustained vibration of up to 0.25G. (G is gravitational acceleration.) G's of acceleration may be computed from vibration readings of amplitude and frequency by the formula:

$$G = .103AF^2$$

"A" is the displacement in inches from the mean and "F" is the frequency in cycles per second. If the anticipated building vibration is greater than 0.25G, complete information regarding frequency and amplitude should be forwarded to the Regional Physical Planning Engineers.

Stray Magnetic Fields

Stray magnetic fields in excess of 50 oersteds will affect the magnetic flux on the disk surfaces. Measures should be taken to insure that the 350 Disk Storage Unit is not subjected to magnetic fields of this density.

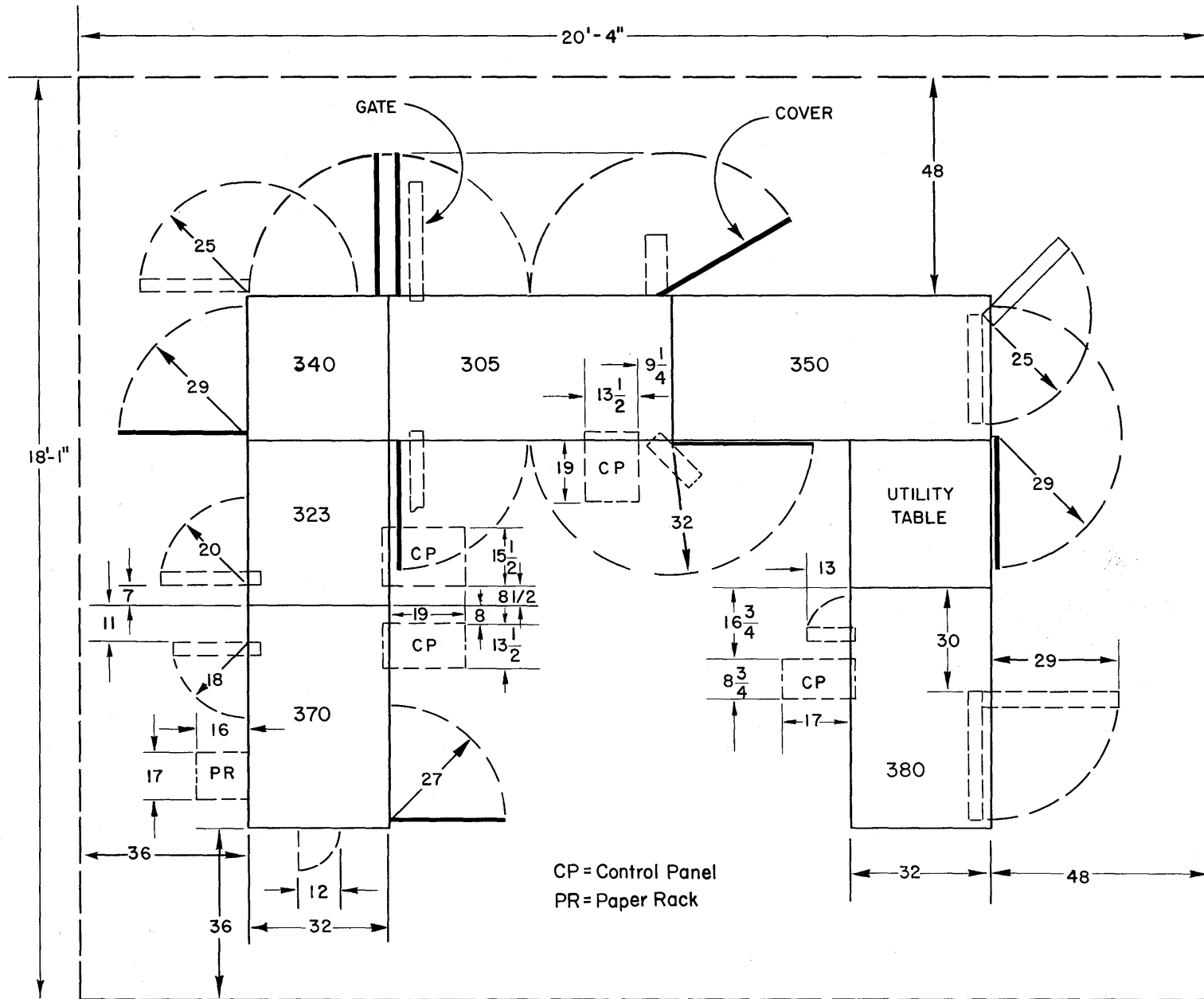


Figure 3. Floor Plan

Power Requirements

Power Specifications

The RAMAC 305 system will operate from either a 208 or a 230 volts, 60 cycle, three phase, four wire service line. The fourth wire is an equipment ground and is not to carry current from any source.

Permissible Variations

Voltage	Source voltage may have a total variation of $\pm 10\%$ of the rated voltage, including transient and steady state.
Phase-to-Phase Balance	The phase voltages must be balanced so that the maximum variation between any two phases does not exceed 10% of the rated voltage.
Frequency	The line frequency must be 60 cycles per second, $\pm 1/2$ cycle per second.

KVA and Current Requirements

	KVA	Current 208 V	KVA	Current 230 V
340 Power Supply Utility Table	12.6	34.5	12.6	31.5
1-350 Single Access	3.8*	10.4	4.8*	12.0
2-350-Dual Access	6.3*	17.5	8.3*	20.8

*The characteristics of the load and the motor on the 350 unit makes the motor operate less efficiently at 230 Volts.

The KVA has been computed from the current measured with all motors running and the compressors pumping, plus the increase in current for the maximum number of accesses in motion.

Power Distribution

If a new power service is being installed for the 305 system, it should be sufficiently large enough to handle future expansion of the system.

Two, four-wire branch circuits are required for a basic RAMAC 305 — one to the 340 power supply for 60 amperes and one to the utility table for 30 amperes. Each circuit should be protected by suitable protection devices. Typical examples are as follows:

1. Safety switch-fuse combination equipped with time delay fuses.
2. Ambient compensated, thermal magnetic, Molded Case circuit breakers.

If circuit breakers are used, their contacts should be rated so that a high current fault will not cause them to weld. If a main-line circuit breaker is used, it should

be capable of being locked in an off position, or a means provided to prevent the circuit breaker from being re-closed by someone other than the C.E. once he has opened it. This is for protection of Customer Engineers servicing the equipment. If ambient compensated circuit breakers are not used, then they should be de-rated with the manufacturer's instructions.

If the protective devices are located outside of the machine room, it is required that a remote means of operation be provided in the machine area. This is a safety precaution so all RAMAC 305 power may be shut off quickly.

The fourth wire is a non-current carrying equipment ground for grounding the frames of the machines; it is *not* a system neutral. This wire should be carried back to an earthen or acceptable building ground.

Lightning Protection

It is recommended that the customer install lightning protection on the secondary power source when:

- a) The utility company installs lightning protectors on the primary.
- b) Primary power is supplied by an overhead power service.
- c) The area is subject to electrical storms or other types of power surges.

A recommended type of service protector to be installed is the GE Pellet-Type, Model 9LA15A1, or its equivalent. Two of either model are necessary for three phase operation.

If lightning protection is desired, the selection of the service protector and its proper installation are to be made by the customer.

Phase Rotation of Receptacles

The three phase power receptacles for the 340 Power Supply and the 350 Disk Storage Unit must be wired for correct phase rotation:

- a) The green wire should be connected to the ground connection.
- b) Looking at the face of the receptacle, the wires should be connected so that phase sequence is counterclockwise — Phase 1, Phase 2, Phase 3.

Receptacles, Plug Connectors, and Power Cords

The system requires one 60 ampere receptacle for the 340 and one 30 ampere receptacle for the Utility Table.

The customer must provide and install the receptacles necessary to supply power to the system. The flexible rubber-covered power cords and plug connectors that connect to the receptacles, see Figure 4, are supplied by IBM.

Figure 1 indicates areas under the 340 and 350 where it is permissible to place receptacles. Receptacles placed in these areas are subject to the following restrictions:

- a) The over-all height of the receptacle mounted on a stand-pipe must not exceed 3½ inches. Mount the receptacle for the 340 so the ground connector points in a horizontal direction, either right or left as you look at the front of the 340.
- b) Receptacles mounted directly in the floor must be either flush with or below the floor level to permit insertion and removal of the plug connectors.

	340 Power Supply	Utility Table
Current Rating	60 Ampere	30 Ampere
Receptacle*	Hubbell #7301	Hubbell #20403 or #20414
Plug Connector	Hubbell #7302	Hubbell #21443
Cord, length	14'	23'
Cord, diameter	1¼"	11/16"
Cord, min. Bending Radius	5"	2½"

*Equivalent receptacles are acceptable.

RECEPTACLE				PLUG		USAGE
SCHEMATIC	MFG. NO.	AMP.	PHASE	IBM PART #	MFG. NO.	
	P & S 5261	15 Amp 125 Volt	1	256341	P & S 5267	381
	Hub 9335	30 Amp 250 Volt	1	256356	Hub 9338	407
	P & S 5661	15 Amp 250 Volt	1	256342	P & S 5664	407
	P & S 7250	20 Amp 250 Volt	3	256344	P & S 9951	407
*	Hub 7301	60 Amp 250 Volt	3	335382	Hub 7302	340 Comp
	Hub 20403 or 20414	30 Amp 250 Volt	3	473214	Hub 21443	Comp

*Ground must be horizontally to the right or the left if the receptacle is on a stand pipe under the 340.
Equivalent receptacles are acceptable.

Figure 4. Schematic of Receptacles

Environmental Requirements

Temperature

When the system is operating, the air temperature entering the RAMAC 305 system must be between 50 and 90°F. (During non-operational periods, when power is OFF, the room temperature must be maintained between 50 and 110°F. However, the air temperature must be brought within the range of 50 to 90°F before the system is started.)

Air cooling will be required in those installations where the air, as it enters the system, exceeds 90°F.

Humidity

The relative humidity of the air in the installation must not exceed 80%. This limit should not be exceeded during operational or non-operational periods.

Air Filtration

Normal filtration of the area, for dust control, can be met with filters that have an efficiency rating of 20% by the National Bureau of Standards discoloration test method.

Special air filtration is necessary in only those installations which will be subject to corrosive gases, salt air, or unusual dirt or dust conditions.

NOTE: The customer should determine if air conditioning equipment is required to maintain the above environmental conditions. A number of factors determine the temperature of the air entering the system; these include heat dissipation of the system, outside temperatures, sun loads, lights, personnel, fresh air, etc. If air conditioning is found necessary, the problem should be referred to an air conditioning engineer.

Heat Dissipation

Units	Total Heat Dissipation (BTU's per hour)	Radiant Heat (BTU's per hour)	Air Moved Through Units By Blowers (CFM)
305	28,270	800	1,400
323	2,500	2,500	none
340	6,830	500	none
350 — 1 Access	3,550	400	180
350 — 2 Access	5,840	400	360
370	900	900	none
380	1,350	1,350	none
Utility Table			
1 Compressor	3,720	400	250
TOTAL 1 Access	47,120	6,850	1,630
TOTAL 2 Access	49,410	6,850	1,810

Recording Instruments

It is recommended that all customers install temperature and humidity recording instruments in the machine room area. These instruments should be of the direct-read type with a seven-day record chart.

Either a visual or audible signalling device should be incorporated into the instrument installation to signal when the temperature or humidity limitations are about to be exceeded. Action can then be taken by the customer's personnel to correct the situation and avoid interruption of the machine operation.

These instruments are not supplied by IBM.

Exhaust-Vent Ducts

If exhaust-vent ducts are used on the RAMAC 305 system, only part of the heat dissipated by the units is taken off by the vent ducts. The radiant heat of the vented units plus the total heat of the other units must be considered when determining the heat load of the room. A light should be installed to indicate when the exhaust fan motor is running.

Additional Machine Units for Installation On An IBM RAMAC 305 System

An Additional 350 Disk Storage Unit. A second 350 Disk Storage Unit may be added to the system to obtain additional storage capacity.

The 381 Remote Printing Station. This unit provides for additional output at remote locations from the records in the Disk Storage units or from information developed during processing.

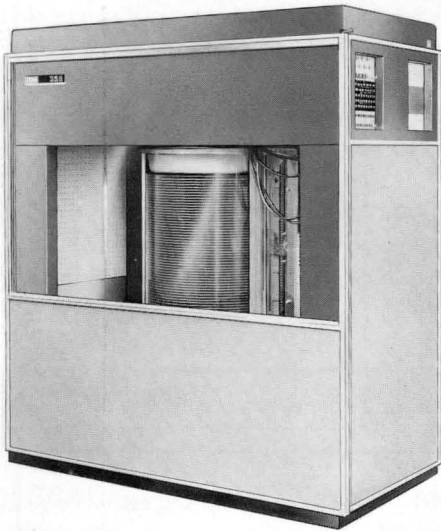
The 382 Paper Tape Reader. The 382 serves as an input to the RAMAC system.

The 407 Printer. The 407 printer may be used in place of the 370 printer, or in parallel with it, or by itself, as a standard accounting machine.

IBM RAMAC 305 Dual System. Dual Processing combines two RAMAC 305 systems, or parts of systems, to permit two processing units access to a Disk Storage Unit at the same time.

The additional machine units should be installed in a room that conforms to the specification previously stated for a RAMAC system with the modifications specified on the following pages.

Additional Storage Unit



The additional storage unit can be connected to the RAMAC 305 basic system to give increased storage. It may be either a Model 2 or 12. The same installation specifications apply to both models.

The effective cable and air hose lengths, listed in Figure 5, will permit location of the additional storage unit in almost any position around the RAMAC "U" and still maintain the service clearances required for all units. The effective cable or air hose length is that portion of cable or air hose which permits the customer to place the Additional Storage Unit so the measuring points shown in Figure 5 can be that distance apart. IBM adds cable or air hose necessary to make the connections inside of the machine units. This will include sufficient cable and air hose to permit movement of the Utility Table for servicing.

The customer has a choice of the effective cable and air hose lengths listed in Figure 5 without an RPQ. However, the cable and air hose marked "X" will be shipped as standard unless otherwise stated on the original order or on an alteration notice at least 90 days before the scheduled shipping date.

Specifications

Weight
1,730 Pounds

Dimensions
65" Long
32" Wide
72" High

Service Clearances

48" Front
48" Rear
48" Right End
0" Left End

KVA and Current Requirements

Unit	KVA	Current		KVA	Receptacle*	
		208 V	230 V		Plug*	Receptacle*
340	12.6	34.5	12.6	31.5	A	C
Utility Table						
2 - 350's (Single Access)	5.6	15.3	7.4	18.6	B	D
2 - 350's (Dual Access)	8.9	24.7	10.6	26.7	B	D

*Notes

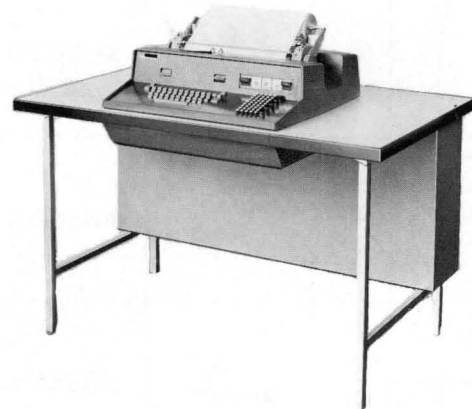
- A = Hubbell # 7302
- B = Hubbell # 21443
- C = Hubbell # 7301 or equivalent
- D = Hubbell # 20403 or 20414 or their equivalent

Heat Dissipation

350 Storage Unit			
Single Access		3,550 BTU	180 CFM
Dual Access		5,840 BTU	360 CFM
Utility Table			
Single Access 350's		3,720 BTU	250 CFM
Dual Access 350's		6,280 BTU	500 CFM

NOTE: When the 350 units have single access, there is only one compressor in the Utility Table. However, with dual access there are two compressors.

381 Remote Printing Station



The customer may connect from one to four 381 units to a RAMAC 305. The 381 is connected to the system by a signal cable between the 381 and the 380. The signal cable has a summary punch type connector on the end that connects to the 380. The other end is attached directly to the 381.

There is a summary punch receptacle mounted in the right-hand end of the 380 for each 381 unit that is connected to it. They are mounted one above the other on 3" centers. Number 1 receptacle is 16" above the floor.

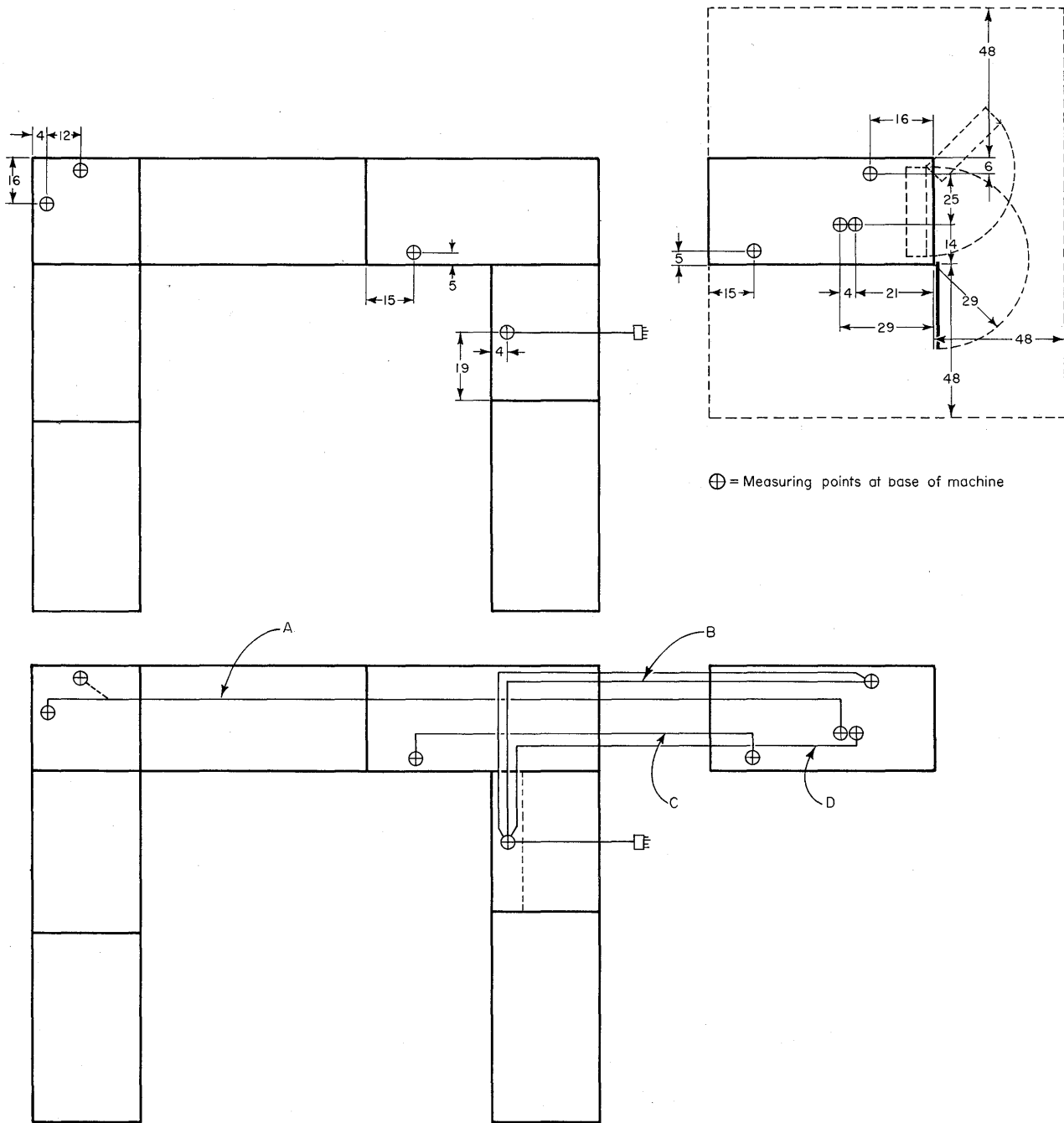


Figure 5. Additional Storage Unit Schematic

<u>Key Name</u>	<u>Where Used</u>	<u>Effective Length</u>
A = DC Power Cable	340 to 350 Model "2" or "12" optional length	X 19' 12'
B = AC Power Cable, and Control Cable	Utility Table to 350 Model "2" or "12" optional length	X 16' 29'
C = Signal	350 Model "1" or "11" to 350 Model "2" or "12" optional length	X 11' 25'
D = Air Hose	Utility Table to 350 Model "2" or "12" optional length	X 16' 29'

Specifications

WEIGHT:	SERVICE CLEARANCE
256 Pounds	36" Front
DIMENSIONS:	36" Rear
48" Long	12" Right Side
30" Wide	12" Left Side
29" High (table top)	BTU
36" Total Height	Negligible
	CFM
	None

Signal Cable

One signal cable 40' long is supplied with each 381. It has an outside diameter of .9", a bending radius of 5" and an effective length of 37'. See Figure 6 for measuring points.

Through the use of additional cable, purchased, installed and maintained by the customer, the 381 may be operated up to 2500 feet from the 380. This cable may be purchased from outside vendors or on an RPQ from IBM.

Power Cord

A 6' power cord with a 15 ampere plug cap is supplied with the 381. The plug is equivalent to a Pass and Seymour plug #5267. See Figure 4 for a schematic of the plug.

Power Requirements

The power requirements are 115 volts, 60 cycle single phase. The voltage variation is not to exceed plus or minus 10% of rated voltage. The frequency variation is not to exceed plus or minus 1/2 cycle.

382 Paper Tape Reader



The 382 Paper Reader is on a unit similar to the utility table in size. It can be located at either end of the "U".

It is connected to the system by two cables—a signal cable for processing and a power cable for its power.

Specifications

WEIGHT:	SERVICE CLEARANCE:
419 Pounds	36" Front
DIMENSIONS:	36" Rear
39" Long	12" Right Side
32" Wide	12" Left Side
29" High (table top)	
36" Total Height	

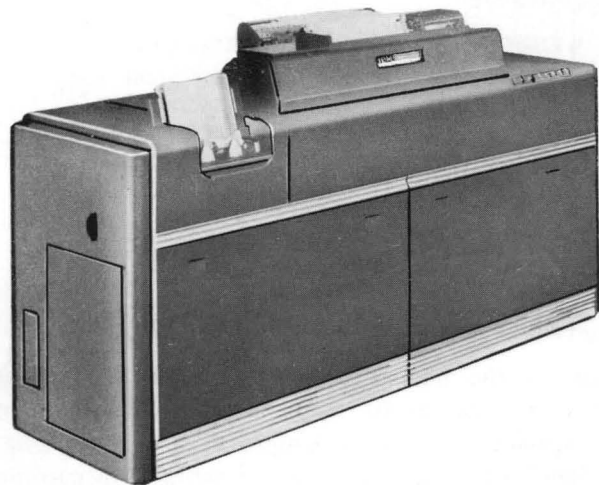
Signal Cable

One signal cable 20' long is supplied with each 382. It has summary punch type connectors on each end. The outside diameter is 1.25" and the cable has a bending radius of 5". It connects between the right end of the 305 and the left end of the 382. Allow 24" for rise and fall.

Power Cable

One power cable 30' long is supplied with each 382. It is permanently wired to both the 382 and the 340 units.

407 Accounting Machine



The 407 is connected to the system with a signal cable and a bonding cable. The signal cable has summary punch type receptacles on both ends. It connects between the 407 and 323. The bonding cable connects between the 407 and the 340 unit. It also has its own power cord and plug assembly which must be connected to an AC source of power.

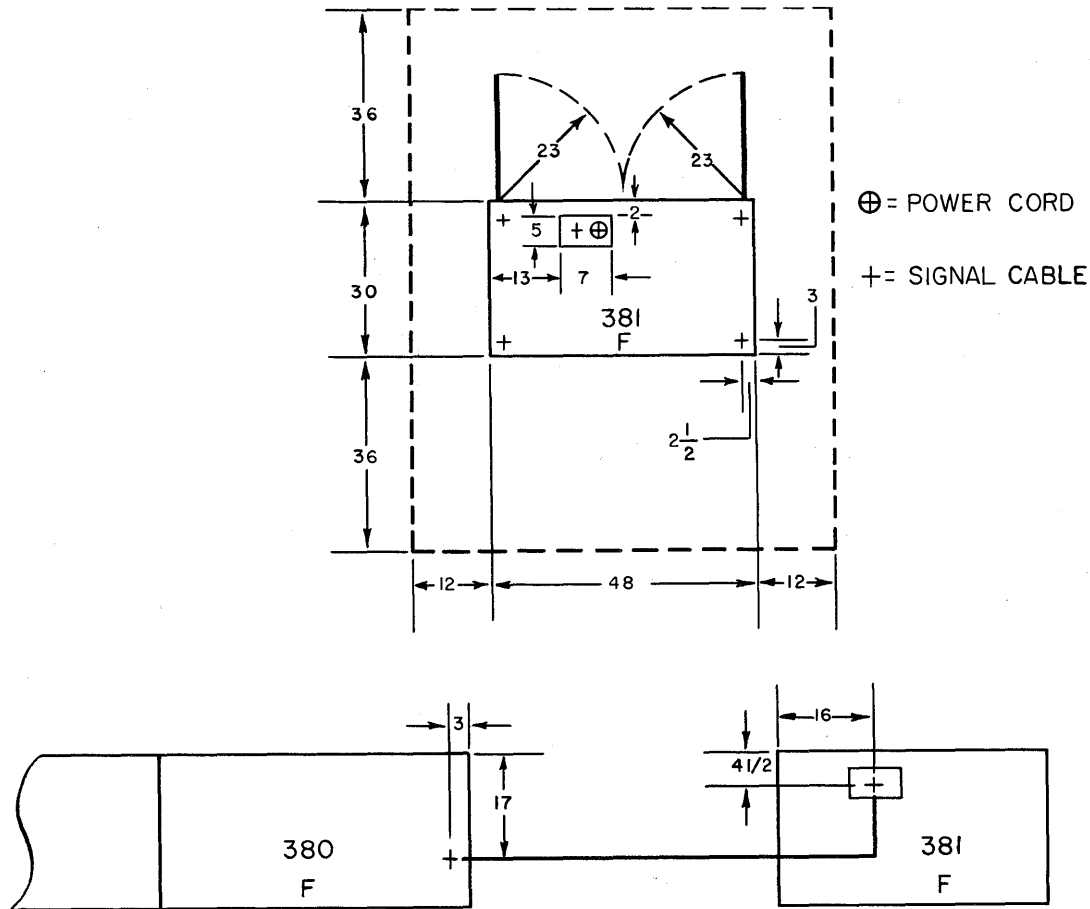


Figure 6. 381 Remote Printing Station Schematic

Specifications

WEIGHT:

2,620 Pounds

DIMENSIONS:

73" Long
31" Wide
51" High

SERVICE CLEARANCES:

57" Front
24" Rear
36" Right Side
36" Left Side

BTU

7500

CFM

None

SIGNAL CABLE:

Effective length "X" 11 1/2'
Optional length 25 1/2'

BONDING CABLE:

Effective length "X" 17'
Optional length 31'

Power Cord

An 8' 9" power cord is supplied with the 407. It is equipped with a Pass and Seymour plug cap rated for the voltage specified. See Figure 4 for plug schematics.

Signal Cable

The customer has the choice of two signal cable lengths for connecting the 407 to the 323. These cable lengths are specified as effective lengths. The effective length is that portion of the cable which permits the customer to place the 407 so the measuring points, shown in Figure 7, can be that distance apart. IBM adds the cable necessary for making the connections inside the machine units.

The cable length marked "X" is shipped as standard with the machine unless otherwise specified on the order or an alteration notice at least 90 days before the scheduled shipping date.

Power Requirements

The 407 can be supplied for the following voltages:

Volts	Phase	Amperes	KVA	Plug #	Receptacle
115	1	15.5	1.8	P & S 9338	P & S 3835
208	1	7.8	1.8	P & S 5664	P & S 5661
230	1	7.8	1.8	P & S 5664	P & S 5661
208	3	8.8	3.2	P & S 9951	P & S 7250
230	3	8.8	3.2	P & S 9951	P & S 7250

The KVA is based on the high line current for the given voltage.

The receptacle or its equivalent must be supplied and installed by the customer.

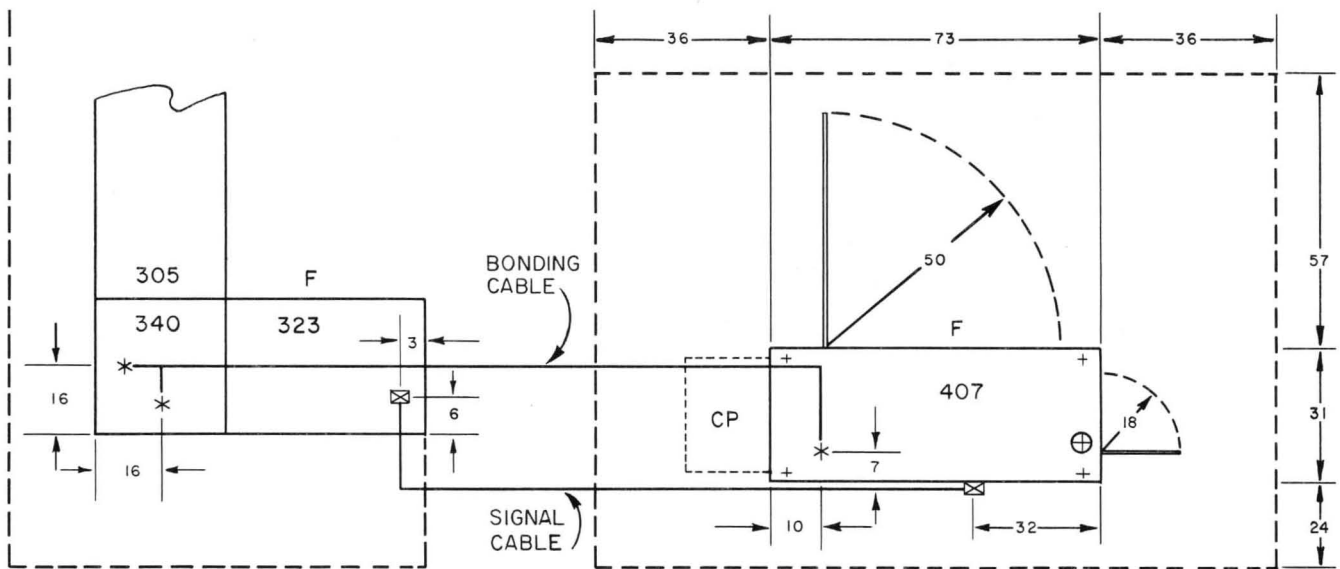


Figure 7. 407 Accounting Machine Schematic

Dual Systems

Two RAMAC 305 systems, as shown in Figure 8, can share the same Disk Storage Unit or Units through the dual system control. Each RAMAC 305 system has its own

access mechanism in the Disk Storage Unit.

The interconnection of two systems to a Disk Storage Unit or Units requires some changes in the specifications described for the basic 305 System. The changes are as follows:

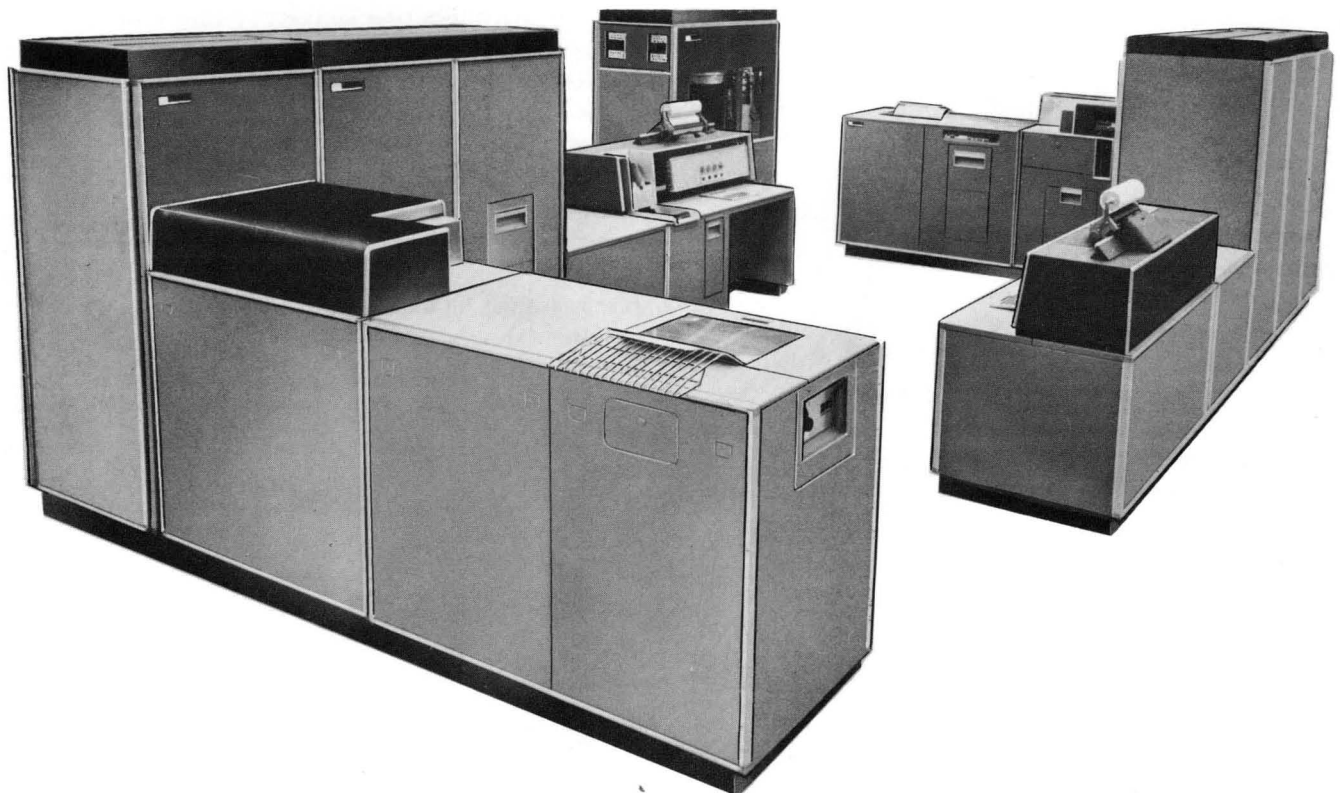


Figure 8. Dual Systems

Power

Each 340 will require a 60 ampere receptacle. The Master Utility Table will require either a 30 ampere receptacle or a 60 ampere receptacle, depending on the number of storage units and the number of access mechanisms, as shown under KVA current requirements.

The power for the 350 units and the compressors in the slave utility table (when required for two 350 units with Dual Access) is included in the power required for the Master Utility Table.

KVA and Current Requirements

Unit	208 Volts		230 Volts		Recep-	
	KVA	Amp.	KVA	Amp.	Plug*	tacle*
340	12.6	34.5	12.6	31.5	A	D
Master Utility Table						
1-350 (Sgle. Access)	4.3	13.4	5.7	14.7	B	C
(Dual Access)	8.8	24.7	10.3	25.9	B	C
2-350 (Sgle. Access)	8.8	24.7	10.6	26.7	B	C
** (Dual Access)	14.6	40.6	17.1	43.0	A	D

*Notes:

- A = Hubbell #7302
- B = Hubbell #21443
- C = Hubbell #20403 or #20414 or their equivalent
- D = Hubbell #7301 or equivalent

**When the dual system has 2 storage units with dual access, two compressors are installed in the slave utility table. They are connected to the master utility table by cable and air hose. They also get their power from the master utility table.

Heat Dissipation

Unit	Total BTU	Radiant BTU	CFM
305	28,270	800	1,400
323	2,500	2,500	-
340	6,830	500	-
350 - Single Access	6,580	400	180
350 - Dual Access	10,320	400	360
370	900	900	-
380	1,350	1,350	-
Utility Table			
1 - 350 Single Access	3,720	400	250
1 - 350 Dual Access	6,280	800	500
2 - 350's Single Access	6,280	800	500
2 - 350's Dual Access	12,560	1,600	1,000*

*This is the total BTU and CFM for both Utility Tables.

Cables

The cables and air hose, shown in the cable and air hose list for Dual System operation, are custom-made and based upon the lengths required for each installation. The cables and air hose are measured and ordered in accordance with the approved layout. Maximum lengths are not to be exceeded without Sales Engineering approval.

The maximum lengths provide some flexibility of the units. However, the 340 and 305 units must be considered as one unit. They are not to be separated.

It is imperative that cables for these systems be ordered at the earliest possible date. Preferably, the order for cables should be submitted with the order for the system. If it is impossible to place the order at that time, the order must be in the San Jose order department three months prior to the scheduled shipping date for the system.

The Regional Physical Planning Engineer is available for assistance in planning the installation and the ordering of the cables for a Dual System.

The schematic layout of units shown in Figure 9, with cables and cable routing, has key numbers assigned to each cable and air hose that must be ordered. The 340 shows two different locations for connecting cables to this unit. All 340 units shipped to the field after March 15, 1959 (Serial #11000) require the cables with key numbers without the "A" suffix, and connect at location G. The 340 units shipped prior to March 15, 1959 (Serial #11000) require the cables with key numbers that have the "A" suffix, and connect at location H. It is, therefore, possible that a customer could have a 305 system with the old 340 unit, then add a system with the new 340, and require both types of cable.

Figure 10 indicates the measuring points on each unit for the cables that connect to that unit. The distance between measuring points for a given cable or air hose is the length that is to be placed on the cable order. San Jose will add the length of cable or air hose necessary for making the connections inside of the machines. This will include sufficient cable and air hose to permit movement of the Utility Table for servicing. If the customer has a false floor or cable raceways, then two times the depth of false floor or raceway must be added to the measured length to determine the effective length required.

Service Clearances

The following service clearances should be observed when the units are removed from the 305 "U" arrangement to accommodate Dual Process.

Unit	Front	Rear	Right Side	Left Side
323	36"	36"	0*	0*
340 - 305 (combination)	48"	48"	24"	36"
350	48"	48"	48"	48"
370	36"	36"	0*	36"
380	36"	36"	36"	36"

*These machine units do not require service clearance for these areas provided the units can be moved forward or backward to provide a service clearance of 36"

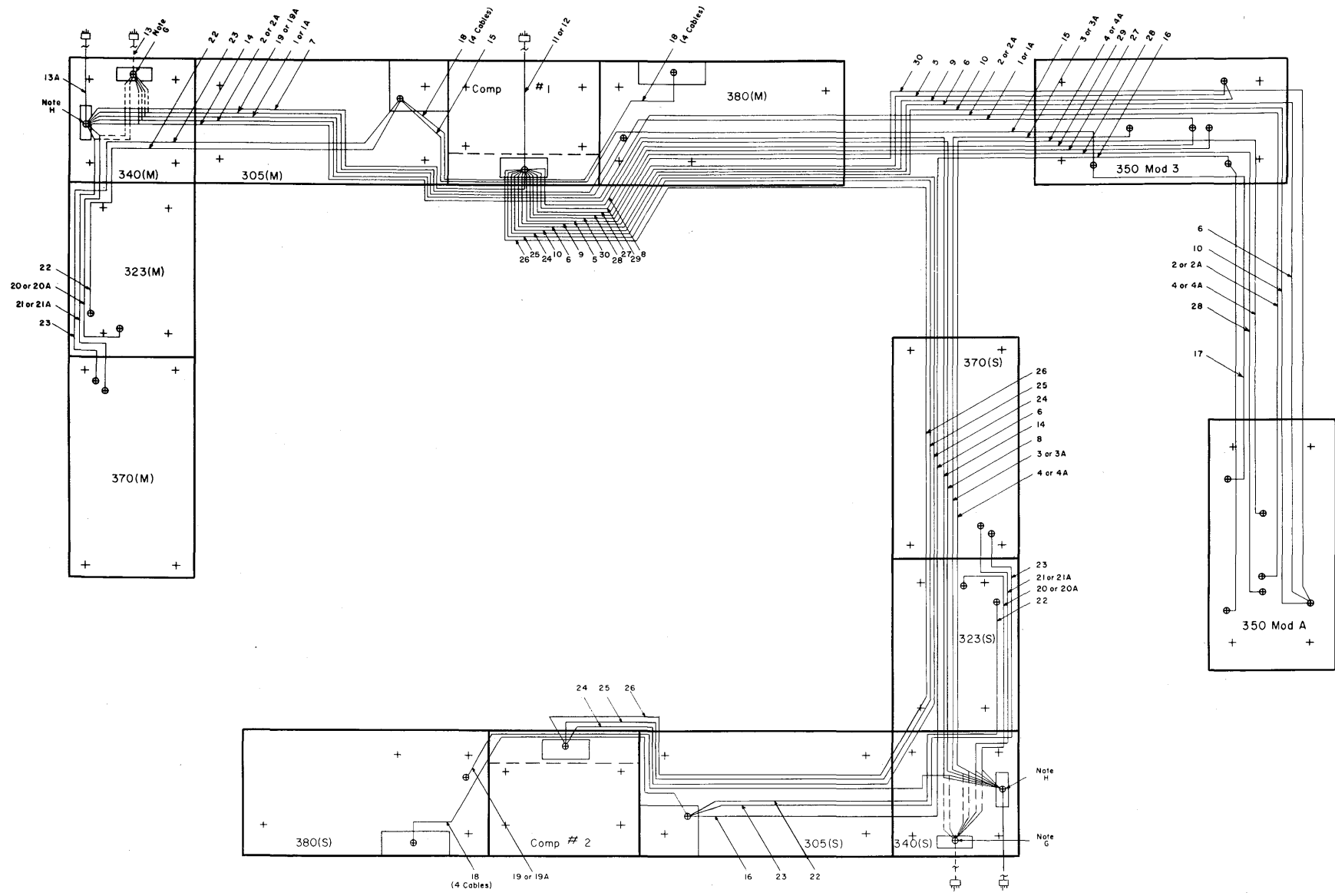


Figure 9. Cable Layout Schematic

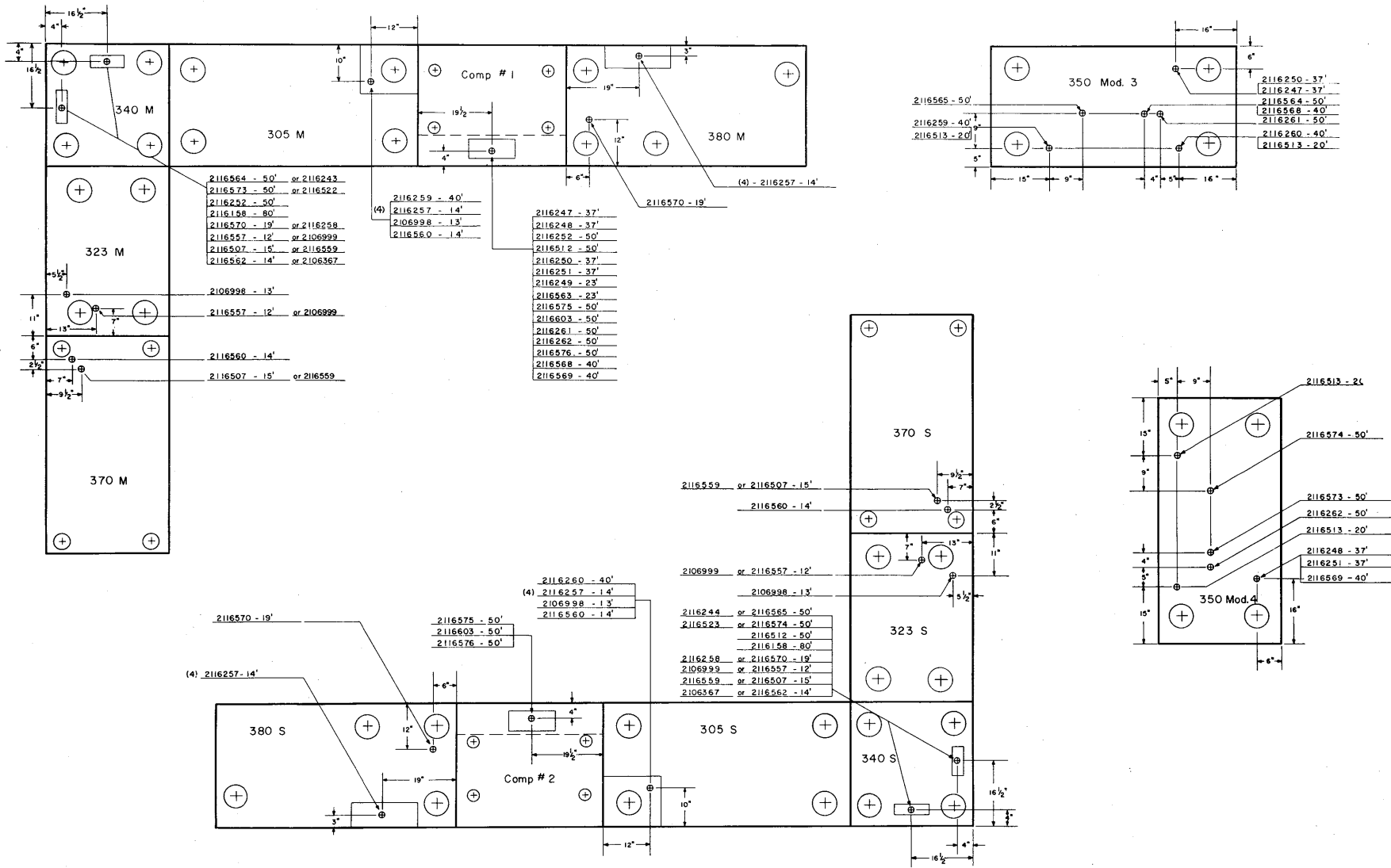


Figure 10. Measuring Point Schematic

Cables and Air Hose—305 Dual Process

Key #	Cable Name	Where Used	Quantity	Cable Part #	Maximum Length	Notes
1	Power Cable	340/M to 350 Mod. 3	1	2116564	50'	G
1A	Power Cable	340/M to 350 Mod. 3	1	2116243	50'	H
2	Power Cable	340/M to 350 Mod. 4	1	2116573	50'	G
2A	Power Cable	340/M to 350 Mod. 4	1	2116522	50'	H
3	Power Cable	340/S to 350 Mod. 3	1	2116565	50'	G
3A	Power Cable	340/S to 350 Mod. 3	1	2116244	50'	H
4	Power Cable	340/S to 350 Mod. 4	1	2116574	50'	G
4A	Power Cable	340/S to 350 Mod. 4	1	2116523	50'	H
5	AC Power	350 Mod. 3 to Comp.	1	2116247	37'	
6	AC Power	350 Mod. 4 to Comp.	1	2116248	37'	
7	Seq. Interlock	340/M to Comp.	1	2116252	50'	H
8	Seq. Interlock	340/S to Comp.	1	2116512	50'	H
9	Seq. Control	350 Mod. 3 to Comp.	1	2116250	37'	H
10	Seq. Control	350 Mod. 4 to Comp.	1	2116251	37'	H
11	AC Power 30 Amp.	Power Cord to Comp.	1	2116249	23'	A
12	AC Power 60 Amp.	Power Cord to Comp.	1	2116563	23'	A
14	Emergency Off	340 to 340	1	2116158	80'	
15	Signal Cable	305/M to 350 Mod. 3	1	2116259	40'	
16	Signal Cable	305/S to 350 Mod. 3	1	2116260	40'	
17	Signal Cable	350 Mod. 3 to 350 Mod. 4	2	2116513	20'	
18	Signal Cable	305 to 380	4 or 8	2116257	14'	C
19	Power Cable	340 to 380	1 or 2	2116570	19'	C-G
19A	Power Cable	340 to 380	1 or 2	2116258	19'	C-H
20	Power Cable	340 to 323	1 or 2	2116557	12'	C-G
20A	Power Cable	340 to 323	1 or 2	2106999	12'	C-H
21	Power Cable	340 to 370	1 or 2	2116507	15'	C-G
21A	Power Cable	340 to 370	1 or 2	2116559	15'	C-H
22	Signal Cable	305 to 323	1 or 2	2106998	13'	C
23	Signal Cable	305 to 370	1 or 2	2116560	14'	C
24	Power Cable	Comp. 1 to Comp. 2	1	2116575	50'	F
25	Control Cable	Comp. 1 to Comp. 2	1	2116603	50'	F
26	Air Hose	Comp. 1 to Comp. 2	1	2116576	50'	F
27	Air Hose	350 Mod. 3 to Comp.	1	2116261	50'	
28	Air Hose	350 Mod. 4 to Comp.	1	2116262	50'	D
29	Control	350 Mod. 3 to Comp.	1	2116568	40'	G
30	Control	350 Mod. 4 to Comp.	1	2116569	40'	G

Notes:

- A. This cable will be supplied either 14 feet or 23 feet long.
- C. The quantity of these cables depends on the number of units in the system.
- D. Air Hose 350 Mod. 4/M to Compressor must connect to the slave compressor when the Disk Storage units have Dual Access.
- F. These cables and air hose are only required for systems with Dual File and Dual Access.
- G. These cables used with new style 340 only.
- H. These cables used with the old style 340 only.

Safety and Fire Precaution Recommendations

An important factor in planning for a computer installation is safety. This consideration is reflected in the choice of a computer location, the building materials used, fire prevention equipment, air conditioning and electrical systems, and personnel training.

The following includes recommendations in all these areas:

I. Locating a Computer Area

- A. The computer area should be housed in a non-combustible or fire resistive building or room.
- B. The computer room should not be located above, below, or adjacent to areas where inflammable or explosive materials or gases are stored, manufactured, or processed. If the customer must locate near such an area, he should take precautions to safeguard the area.

II. Structural Safety

- A. Walls enclosing an installation area should be of noncombustible materials wherever possible. These walls should extend from floor to ceiling. If walls are made of combustible material, they should be protected as prescribed by code.
- B. If a computer area has one or more outside walls adjacent to a building which is susceptible to fire, installation of shatterproof windows in the computer area would enhance the safety of personnel and equipment from flying debris and water damage.
- C. Where a false (or "hung") ceiling is to be added, it should be of non-combustible or fire-resistant material. All ducts and insulating materials should be noncombustible and non-dusting. If combustible materials are used in the space between the regular ceiling and the false ceiling, proper protection should be provided.
- D. If the regular floor is of combustible material, it should be properly protected from the ceiling below—preferably by water sprinklers.

III. Type of Fire Prevention Equipment in a Computer Area

- A. Portable carbon dioxide fire extinguishers of suitable size (15 pounds) and number should be provided in the machine room. This is the recommended non-wetting agent for electrical equipment (Class C Hazard).
Extinguishers should be overhead, marked and readily accessible to individuals in the immediate area.
Local codes govern the frequency of inspecting the cylinders (which is done by weighing for dissipation of contents).

- B. Where portable carbon dioxide cylinders are used as the primary extinguishing agent, it would be advisable to locate a standpipe or hose unit within effective range of the computer area as a secondary (or "back-up") extinguishing agent for a Class A Hazard (such as paper, cards, etc.).
- C. In some cases local building codes and ordinances, or insurance regulations, require automatic water sprinklers. One of the following should be used, if it conforms to such codes and ordinances:
 1. Pre-action sprinkler system. High temperature actuate heat-sensitive devices, which open a control valve. This valve, located outside the room, admits water into the sprinkler piping before the sprinkler heads operate. This type of system minimizes the possibility of accidental discharge of water due to failure or mechanical breakage of the automatic sprinkler heads.
 2. Higher temperature sprinkler heads. Replace the sprinkler heads with high-rated heads—preferably in the intermediate range (175°F rating).
- D. A fire detection system should be installed to protect the computer area. This detection system should actuate an alarm and shut down the air conditioning system.

IV. Data Storage

- A. Any data stored in the area, whether in the form of magnetic tape, paper tape, cards, or paper forms, should be in enclosed metal cabinets or fire-resistant containers.
- B. For security purposes or for maintaining duplicates of master records, a separate storage room should be used. This should be of fire-resistant material and contain the same type of fire prevention equipment as described in Section III.

V. Supporting Facilities

A. Air Conditioning Systems

1. In some installations the computer area is controlled by a completely separate air conditioning system. In these cases an emergency power-off switch should be placed in a convenient location, preferably near the operating console or next to the main exit door. Fuseable-link dampers should be located at fire walls and at places as prescribed by local code.
2. In other installations the standard building air conditioning system is used along with supplemental units in the computer area. The supplemental units would then be han-

dled as stated above. The building air conditioning system should have an alarm located in the regular building maintenance area to alert the maintenance personnel of an emergency.

Air ducts serving other areas but passing through the computer room should contain fuseable-link dampers at each wall of the computer room.

3. Exhaust hoods are sometimes used directly over a unit to remove the machine-generated heat from the room via a duct. When this is done, the hood fan motor should be tied into the emergency power-off switch as described above in item 1. There should be a light to indicate when the hood fan motor is in operation.
4. The air filters to be used as part of the air conditioning system should contain non-combustible material.

B. Electrical Systems

1. The main line breaker for the computer equipment should be pushbutton operated. This pushbutton control should be in a convenient location, preferably near the operating console or next to the main exit door. A light should be installed to indicate when power is ON.
2. Some local codes require a special battery operated lighting unit which will automatically illuminate an area in case of power or lighting circuit failure. Even when not required by code, it is recommended that such lights be installed.
3. Protection against lightning surges can be obtained by installing lightning arresters on the secondary power source. This can be most easily done when:
 - a. The utility company installs lightning protectors on the primary power source.

- b. Primary power is supplied by an overhead power service.

VI. Pre-planning to Continue Operation in an Emergency

- A. The continued operation of a computer is dependent on information stored on cards, disks, drums, etc. Duplicate or master records should be maintained from which the necessary information can be taken to resume operation. These records should be stored in a remote area. Arrangements should be made for emergency use of other equipment, transportation of personnel, data, and supplies to a temporary location.
- B. Where the continuity of operation is essential, a stand-by auxiliary power source should be installed.

VII. General Precautions and Personnel Training

- A. The computer room and data storage room should be monitored during non-operating hours.
- B. Steampipes and waterpipes running above the false ceiling should be inspected to guard against possible damage due to accidental breakage, leakage or condensation.
- C. Emergency exit doors should be located in the computer area. The number of doors is dependent upon the size and location of the area.
- D. Personnel should be trained in such emergency measures as:
 1. Proper method and sequence of shutting off all electrical power.
 2. Shutting off air conditioning system.
 3. Handling fire extinguishers in the approved manner.
 4. Properly operating a small diameter fire hose.
 5. Evacuating records.
 6. Evacuating personnel.
 7. Calling fire company.

